

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-15. Canceled.

16. (Currently Amended) A rock boring device ~~of the type comprising:~~
a boom having a first end and a second end, the first end being pivotable about a first boom axis;
a disc cutter pivotably mounted to the second end of the boom to pivot about a second boom axis and structured to engage a rock face; and
an inertial reaction mass to stabilize the disc cutter; wherein said disc cutter is structured to be driven in an oscillating manner and movable in a nutating manner, the disc cutter rotating about a rotation axis that is substantially perpendicular to the second boom axis, said disc cutter including a substantially continuous, circumferential cutting edge defining a leading tip and a trailing heel, the leading tip of the disc cutter being movable along a path that is substantially parallel to the rock face and substantially perpendicular to the rotation axis to effect rock boring, the trailing heel of the disc cutter being spaced from said rock face during cutting.

17. (Previously Presented) A rock boring device as claimed in claim 16, wherein said disc cutter is free to rotate.

18. (Previously Presented) A rock boring device as claimed in claim 16, wherein said rock boring device includes a mounting section for said disc cutter and a driven section, and

wherein said mounting section is angularly offset from an axis of said driven section whereby said disc cutter will both oscillate and nutate.

19. Canceled.

20. (Previously Presented) A rock boring device as claimed in claim 18 wherein said mounting section is angularly offset from an axis of said driven section by an angle greater than 0° and less than 10°.

21-23. Canceled.

24. (Currently Amended) A rock boring ~~machine~~ device as claimed in claim ~~22~~16, wherein said first boom axis is substantially vertical.

25. Canceled.

26. (Currently Amended) A rock boring ~~machine~~ device as claimed in claim ~~21~~16, wherein said ~~rock boring device is supported by said boom such that said device is pivotable about boom~~ boom is rotatable about a longitudinal axis of said boom.

27-31. Canceled.

32. (Previously Presented) A rock boring device according to claim 16, wherein said disc cutter is driven in said nutating manner.

33. (Previously Presented) A rock boring device according to claim 16, wherein said disc cutter is driven in said oscillating manner and is free to nutate.

34-36. Canceled.

37. (Currently Amended) A rock boring device according to claim ~~36~~16, wherein the cutting ~~surface~~edge includes a plurality of cutting tips that are removably connected to the disc cutter.

38. (Currently Amended) A rock boring device according to claim ~~36~~16, wherein the cutting ~~surface~~edge includes a plurality of cutting tips that are permanently connected to or formed as part of the disc cutter.

39. (Currently Amended) A rock boring device according to claim ~~36~~16, wherein the cutting ~~surface~~edge includes a plurality of bits.

40. (Currently Amended) A rock boring device according to claim ~~36~~16, wherein the cutting ~~surface includes~~edge comprises a substantially continuous cutting ring.

41-44. Canceled.

45. (Currently Amended) A rock boring device according to claim 21, wherein the inertial reaction mass is annular and substantially surrounds the disc cutter.

46. (Currently Amended) A rock boring ~~machine device~~ as claimed in claim ~~21~~16,

wherein:

the boom is structured to pivot about ~~a~~the first boom axis to allow global pivoting of the combined boom and disc cutter,

the boom is rotatable about a ~~second longitudinal boom~~ axis that is substantially transverse to or perpendicular to the first boom axis, and

the disc cutter ~~is and~~ the inertial reaction mass are structured to pivot about ~~a third the second boom axis substantially perpendicular or transverse to the second axis~~, to allow local wrist-like pivoting movement of the disc cutter and the inertial reaction mass with respect to a ~~distal the second~~ end of the boom.

47. (Currently Amended) A rock boring ~~machine device~~ as claimed in claim 46, wherein the disc cutter is structured to pivot about the ~~third~~second boom axis in a first direction and the boom is structured to pivot about the first boom axis in a second direction, wherein the first and second directions are substantially the same just before the disc cutter engages the rock face.

48. Canceled.

49. (Currently Amended) A rock boring ~~machine device~~ as claimed in claim ~~48~~16, wherein the inertial reaction mass is structured, in use, to counteract an impact force created upon impact with the ~~ledge~~rock face.

50. (New) A rock boring device comprising:

a disc cutter structured to engage a rock face and an inertial reaction mass to stabilize the disc cutter; wherein said disc cutter is mounted on a housing including a driven section having a first axis of rotation and a mounting section that supports the disc cutter for rotation about a second axis of rotation that is offset from the first axis of rotation, so that the disc cutter is driveable in an oscillating manner and movable in a nutating manner; and

a boom to support the disc cutter, said boom being pivotable about a first boom axis so as to translate the disc cutter along a path that is generally parallel to the rock face, the disc cutter being mounted on said boom to pivot about a second boom axis that is substantially perpendicular with the first axis of the driven section, the disc cutter being maintained at a proper attitude relative to the rock face by pivoting of the disc cutter about the second boom axis in a direction that is opposite to a direction in which the boom pivots about the first boom axis during cutting, said disc cutter defining a substantially continuous circumferential cutting edge.

51. (New) A rock boring device according to claim 50, wherein the disc cutter includes a tip to engage the rock face and heel positioned opposite said tip, wherein the tip and heel of the disc cutter define with ground a non-zero rake angle such that the heel is positioned to avoid contact with the rock face.

52. (New) A rock boring device according to claim 50, wherein the cutting edge includes a substantially continuous cutting ring formed on a larger diameter portion of a conic section.

53. (New) A rock boring device according to claim 50, wherein the inertial reaction mass substantially surrounds the disc cutter and includes a plurality of stacked iron and lead plates coupled to pivot with the disc cutter about said second boom axis.

54. (New) A rock boring device as claimed in claim 50, wherein the boom is structured to pivot about the first boom axis to allow global pivoting of the combined boom and disc cutter,

the boom is rotatable about a longitudinal boom axis that is substantially transverse to or perpendicular to the first boom axis, and

the disc cutter and the inertial reaction mass are structured to pivot about the second boom axis to allow local wrist-like pivoting movement of the disc cutter and the inertial reaction mass with respect to a distal end of the boom.

55. (New) A rock boring device comprising a disc cutter to engage a rock face and an inertial reaction mass to stabilize the disc cutter, said reaction mass being relatively large compared to the disc cutter;

wherein said disc cutter includes a substantially continuous, circumferential cutting edge positioned at a periphery of the disc cutter, said disc cutter rotating about a rotation axis and defining a cutting plane substantially perpendicular to the rotation axis, said disc cutter being structured to be driven in an oscillating manner and movable in a nutating manner with respect to the mass such that in operation, when engaging the rock face, an inertial force is transmitted via

the disc cutter to the rock face thereby effecting rock cutting generally radially from said disc cutter cutting edge.

56. (New) A rock boring device according to claim 55, wherein the inertial reaction mass is annular and substantially surrounds the disc cutter.

57. (Currently Amended) A rock boring device as claimed in claim 55, further comprising a boom is structured to pivot about a first boom axis to allow global pivoting of the combined boom and disc cutter, wherein

the boom is rotatable about a longitudinal boom axis that is substantially transverse to or perpendicular to the first boom axis, and

the disc cutter and the inertial reaction mass are structured to pivot about a second boom to allow local wrist-like pivoting movement of the disc cutter and the inertial reaction mass with respect to a distal end of the boom.

58. (New) A rock boring device according to claim 55, wherein the cutting edge includes a substantially continuous cutting ring formed on a larger diameter portion of a conic section.

59. (New) A rock boring device according to claim 55, wherein the disc oscillates about an axis substantially normal to the disc.

60. (New) A rock boring device as claimed in claim 55, wherein said disc cutter is free to rotate.

61. (New) A rock boring device as claimed in claim 55, wherein said rock boring device includes a mounting section for said disc cutter and a driven section, and wherein said mounting section is angularly offset from an axis of said driven section whereby said disc cutter will both oscillate and nutate.

62. (New) A rock boring device as claimed in claim 61, wherein said mounting section is angularly offset from an axis of said driven section by an angle greater than 0° and less than 90° .

63. (New) A rock boring device as claimed in claim 61, wherein said mounting section is angularly offset from an axis of said driven section by an angle greater than 0° and less than 10° .

64. (New) A rock boring device according to claim 55, wherein said disc cutter is driven in said nutating manner.

65. (New) A rock boring device according to claim 55, wherein the disc cutter includes a tip to engage the rock face and heel positioned opposite said tip, wherein the tip and heel of the disc cutter define with ground a non-zero rake angle such that the heel is positioned to avoid contact with the rock face.

66. (New) A rock boring device according to claim 65, wherein the rake angle is variable.

67. (New) A rock boring device according to claim 55, further comprising a mounting section for the disc cutter, the mounting section including a primary bearing substantially aligned with a load path of the disc cutter and a secondary bearing provided to preload the primary bearing.

68. (New) A rock boring device according to claim 67, wherein a reaction force created by engagement of the rock face is substantially along the line extending through the primary and secondary bearings.

69. (New) A rock boring device as claimed in claim 55, further including a boom for supporting said disc cutter.

70. (New) A rock boring device as claimed in claim 69, wherein said boom is adapted to pivot about a first axis.

71. (New) A rock boring device as claimed in claim 70, wherein said boom is adapted to pivot about a second axis.

72. (New) A rock boring device as claimed in claim 70, wherein said first axis is substantially vertical.

73. (New) A rock boring device as claimed in claim 70, wherein said first axis is substantially horizontal.

74. (New) A rock boring device as claimed in claim 69, wherein said rock boring device is supported by said boom such that said device is pivotable about a longitudinal axis of said boom.

75. (New) A rock boring device as claimed in claim 69, wherein said rock boring device is supported to pivot relative to said boom.

76. (New) A rock boring device as claimed in claim 55, wherein a linear cutting velocity of said rotary disc cutter is controlled by interaction with a computer that processes algorithms with variable information input being provided by strain gauges and accelerometers mounted adjacent to said rotary disc cutter.

77. (New) A rock boring device as claimed in claim 55, including means to reference the position of the machine with respect to the rock face, thereby allowing a predetermined depth of cut to be maintained at said rock face throughout a cutting cycle.

78. (New) The rock boring device as claimed in claim 77, wherein said machine is anchored with respect to said rock face thereby allowing a predetermined depth of cut to be maintained at said rock face throughout a cutting cycle.

79. (New) A rock boring device as claimed in claim 55, further comprising a boom structured to pivot about a first boom axis to allow global pivoting of the combined boom and disc cutter; and the disc cutter is structured to pivot about a second boom axis substantially perpendicular or transverse to the first boom axis, to allow local wrist-like pivoting movement of the disc cutter with respect to a distal end of the boom.

80. (New) A rock boring device as claimed in claim 79, wherein the disc cutter is structured to pivot about the second boom axis in a first direction and the boom is structured to pivot about the first boom axis in a second direction, wherein the first and second directions are substantially the same just before the disc cutter engages the rock face.

81. (New) A rock boring device as claimed in claim 55, wherein the disc cutter is structured to move in a direction substantially along the rock face just before impacting a ledge protruding away from the rock face.

82. (New) A rock boring device as claimed in claim 81, wherein the inertial reaction mass is structured, in use, to counteract an impact force created upon impact with the ledge.

83. (New) A rock boring device comprising:

a boom having a first end and a second end, the first end being pivotable about a first boom axis;

a disc cutter mounted to the second end of the boom and structured to engage a rock face the disc cutter including a substantially continuous, circumferential cutting edge; and

an inertial reaction mass, relatively large compared to the disc cutter, to stabilize the disc cutter; wherein said disc cutter is structured to be driven in an oscillating manner with respect to the mass such that in operation, when engaging the rock face, a high inertial force is transmitted via the disc cutter to the rock face thereby effecting rock cutting generally radially from said disc cutter.

84. (New) A rock boring device according to claim 83, wherein the inertial reaction mass substantially surrounds the disc cutter.

85. (Currently Amended) A rock boring device as claimed in claim 83, wherein:

the boom is structured to pivot about the first boom axis to allow global pivoting of the combined boom and disc cutter,

the boom is rotatable about a longitudinal boom axis that is substantially transverse to or perpendicular to the first boom axis, and

the disc cutter and the inertial reaction mass are structured to pivot about a second boom axis substantially perpendicular or transverse to the longitudinal axis, to allow local wrist-like pivoting movement of the disc cutter and the inertial reaction mass with respect to a distal end of the boom.

86. (New) A rock boring device according to claim 83, wherein the cutting edge includes a substantially continuous cutting ring formed on a larger diameter portion of a conic section.